

U.S. Patent Application Serial No. **10/768,180**
Response filed February 23, 2007
Reply to OA dated August 29, 2006

REMARKS

Claims 1-20 are pending in this application, with claims 3, 5, 7-10 and 13-18 withdrawn from consideration. Claims 1, 4, 5, 6-12 and 20 have been amended herein. Upon entry of this amendment, claims 1-20 will be pending, with claims 3, 5, 7-10 and 13-18 withdrawn from consideration.

The Applicant respectfully submits that no new matter has been added. It is believed that this Amendment is fully responsive to the Office Action dated **August 29, 2006**.

Support for the amendments to claims 1, 4, 5, 12 and 20 is detailed below. Claims 6-11 have been amended only to change the dependency of these claims from multiply dependent from "any one of claims 1 to 5," to singly dependent from claim 1.

The abstract of the disclosure is objected to. (Office action page 3)

The objection to the abstract is respectfully traversed and reconsideration of the objection is requested.

The Examiner states that the first sentence is incomplete, apparently noting that the first sentence lacks a subject and a verb. However, Applicant submits that this format for an abstract is not only allowed, but is encouraged by the USPTO. The USPTO discourages use of phrases such as: "This disclosure concerns," which would be the missing subject and verb (MPEP 608.01(b)(C)). See, for example, the first line in the sample abstract in MPEP 608.01(b)(E)(1).

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Claim 4 is objected to. (Office action page 3)

The objection is overcome by the amendment to claim 4, in which the abbreviations are written out in full, as requested by the Examiner. Withdrawn claim 5 has also been amended to remove the abbreviations.

Claims 6, 11, 12, 19 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office action, page 4)

1) With regard to claims 6, 11, 12, 19 and 20, the Examiner refers to the wording “said functional element” in claim 6, which finds antecedent basis in “one or more functional elements” in claim 1. The rejection is overcome by the amendment to claim 1, in which the phrase “comprises one or more functional elements” is amended to --comprises a functional element--, therefore clearly providing antecedent basis for the later recitation of “said functional element.” The scope of the claim is not changed by this amendment, since “comprises” is an open-ended transitional phrase, and the original recitation of “one or more” was therefore redundant.

2) With regard to claim 12, the Examiner states that it is unclear what structural limitations are introduced by the product-by-process limitation: “produced upon periodically introducing said positive hole-transporting functional groups and/or said electron-transporting functional groups to said biopolymer and/or said synthetic polymer.” For clarity, claim 12 has been amended to delete the wording “produced upon ... introducing,” replacing this with the wording “are contained

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periodically therein.” That is, the product-by-process limitation has been replaced, for clarity, with the corresponding structural limitation.

3) The Examiner rejects claim 20 over the language that the “electrical output of the field effect transistor can be controlled by applying a predetermined level of the electric field,” stating that “can be” renders it further unclear whether the control and/or application are intended to be positive limitations of the claim.

For clarity, claim 20 has been amended to amend the phrase: “and an electrical output of the field effect transistor can be controlled” with --wherein an electrical output of the field effect transistor is controlled--. This amendment clarifies that this limitation of the claim is not an “intended use,” but is a functional limitation on the device.

Claims 1, 2, 4, 6, 11, 12, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (U.S. 6,486,489) in view of Tierney et al. (J. Org. Chem. (2000) vol. 65, pp. 5355-5359). (Office action, page 5)

The rejection is respectfully traversed, and reconsideration of the rejection is requested.

The Examiner cites Watanabe et al. for disclosing a “transistor comprising DNA wires; i.e. carrier transporting material,” citing column 12, lines 11-26. (Applicant notes that Watanabe never uses the term “DNA wires.” In the cited portion of the reference, DNA is connected to a source, gate or drain electrode of a transistor, and in other portions of the reference, DNA is connected to wires (see column 2, lines 55-60)). The Examiner also cites Tierney as teaching DNA complexed with

phenothiazine as being more stable than unlabeled DNA and used for charge transfer. The Examiner combines the references by stating that it would have been obvious “to have used the phenothiazine-complexed DNA of Tierney in the transistor of Watanabe where the motivation would have been to improve the transistor by using a more stable DNA duplex”

In traversing the rejection, Applicant submits that it is well-known in the art that DNA itself is a polymer having electrical conductivity, but the level of the electrical conductivity thereof is very low, along with other disadvantages described in the specification. To solve this problem, thereby remarkably increasing the level of electrical conductivity, the present invention discloses use of the specified functional elements, recited in the claims of this application, in an electronic device. That is, according to the present invention, an improvement of the electrical conductivity can be attained by continuously carry out a redox (electrical conductive) modification near the electrodes.

Further, according to the present invention, DNA is used as a so-called "foothold" for disposing redox modification functional groups or side chains in an adjacent position. That is, the present invention proposes disposing the modification functional groups at such a distance that the modification functional groups used as a side chain can directly interact with one another without using DNA to which the modification groups are attached. In other words, an electrical conductivity of DNA itself is not always essential to the present invention.

Contrary to this, Watanabe et al. disclose a transistor in which unmodified DNA is used. As is apparent from Watanabe et al., their invention relies upon electrical conductivity of DNA itself.

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Tierney et al. disclose DNA complexed with phenothiazine. However, according to Tierney et al., redox modification functional groups can be attached to end portions of DNA and thus they cannot be continuously introduced to DNA. In addition, the adjacent functional groups as a side chain are disposed at a large distance, and thus it is apparent that Tierney et al. depend on electrical conductivity of DNA itself.

From the above differences between the present invention and Watanabe et al. or Tierney et al., it is apparent that the present invention has unexpected results over the cited references, particularly, in view of the direct interaction between the adjacent modification functional groups, as a side chain, without utilizing the presence of DNA itself, thereby ensuring a sufficiently increased level of the electrical conductivity.

Claims 1, 2, 4, 6, 11, 12, 19 and 20 are therefore not obvious over Watanabe et al. (U.S. 6,486,489) in view of Tierney et al. (J. Org. Chem. (2000) vol. 65, pp. 5355-5359).

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (U.S. 6,486,489) in view of Tierney et al. (J. Org. Chem. (2000) vol. 65, pp. 5355-5359) as applied to claims 1, 2, 4, 6, 11, 12, 19 and 20 above, and further in view of Kronlage (GB 1278281). (Office action page 6)

The rejection of claim 19 is respectfully traversed, and reconsideration of the rejection is requested.

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The Examiner cites Kronlage for the general disclosure of FET transistors with PNP and NPN junctions.

In traversing the rejection, Applicant first of all notes the above arguments that base claim 1 is not obvious over the combination of Watanabe et al. and Tierney et al.

With regard to Kronlage, there is no disclosure in Kronlage regarding biopolymers or polymers that might meet the limitations of the present claims. Kronlage clearly does not anticipate the present claims. Moreover, there is no specific suggestion in Kronlage to modify Watanabe or Tierney.

In addition, claim 19 depends from claim 12, which requires that "said functional element is an electrically conductive wire wherein said positive hole-transporting functional groups and/or said electron-transporting functional groups to said biopolymer and/or said synthetic polymer are periodically contained therein." There is no disclosure of, or suggestion for, this periodic structure of the positive hole-transporting functional groups and the electron-transporting functional groups, in any of the cited references.

Applicant submits that no modification of Tierney and Watanabe based on Kronlage's disclosure could produce the invention of claim 20. Moreover, the Examiner's motivation for combining the references is unclear. Specifically, it is not clear what structural modification of Tierney or Watanabe is being suggested by Kronlage's general disclosure of FET transistors.

Reconsideration of the rejections and objections is therefore respectfully requested.

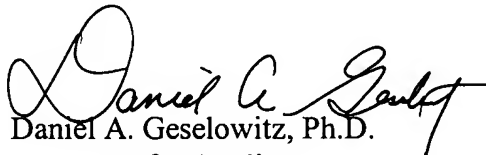
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If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the Applicant's undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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